Wastewater Regionalization

The DOW has directed major efforts toward promoting wastewater regionalization. Small wastewater treatment plants, particularly those referred to as "package" plants, tend to be less effective and less efficient than larger plants. A majority of Kentucky's 2859 non-municipal permitted wastewater treatment facilities are package plants. Regional wastewater treatment facilities eliminate discharges from many of these existing small plants by diverting the flow to a larger facility or by combining two or more existing facilities into a new or selected regional treatment facility. Regional facilities also prevent new discharges by requiring connection to an existing facility or creating sanitary districts and regional wastewater authorities.

The DOW is working to raise the public and technical sector awareness about the need for regionalization. Several presentations have been made and more are scheduled around the state. Further, there is a coordinated effort to ensure that the various branches within the DOW promote the concept through their actions and contracts. As part of the regionalization effort, the DOW obtained information on wastewater facilities in 38 counties. Maps of these counties were prepared using Geographic Information System (GIS) data. The maps show streams, roads, cities, and permitted wastewater treatment facilities and are used in the DOW's educational and promotional efforts. A cooperative effort by the DOW, the Purchase Area Development District, and the U.S. Geological Survey combined appropriate data. Data compiled by the DOW on the performance of 757 private facilities and 58 small municipal plants in the 38 counties from April 1989 through March 1990 indicated that performance of these facilities was not good. DOW personnel have visited 15 of the 38 counties to encourage regionalization.

Since 1990, the DOW has used 100% federal funds from Section 205(j)/604(b) of the Clean Water Act to assist it and regional planning organizations in developing regionalization approaches to treat wastewater (Table 5-8). The program stipulates that 40% of the federal funds received since Federal Fiscal Year (FFY) 1988 be passed through to local or regional planning entities for water quality management planning activities. The DOW has expressly required recipient agencies to pursue regionalization activities with this funding. The objective of this initiative is to discourage the construction of new, small privately owned package treatment plants and to assist in improving the performance of package plants for which regionalization is not feasible. Contracts with six area development districts, one regional health organization, and the Council of State Governments have provided information for the development of regionalization strategies at the state and local level. These agencies have provided technical assistance to many plants to enhance water quality.

Kentucky's 15 Area Development Districts (ADDs) are regional planning agencies empowered to engage in the work of program development through administrative, research, and planning efforts in their constituent counties in order to encourage the development of public and private property in the most appropriate relationships. Among their many duties, the ADDs may advise municipalities and special districts seeking technical and financial

Table 5-8

Section 205(j)/604(b) Water Quality Management Planning Funds

FFY 1988-1993

	FFY 1988	FFY 1989	FFY 1990	FFY 1991	FFY 1992	FFY 1993	TOTAL
Bluegrass ADD	$44,000	$32,000		$32,000			$108,000
Purchase ADD		$32,011	$69,400	$17,177	$24,823	$50,000	$193,411
Big Sandy ADD		$32,000	$29,400	$7,684	$26,916		$96,000
Council of State Governments	$5,428			$17,872			$23,300
Gateway District Health Dept.	$31,000			$31,000	$4,560	$31,000	$97,560
Lake Cumberland ADD	$36,500						$36,500
Green River ADD						$30,000	$30,000
Kentucky River ADD						$33,000	$33,000
TOTAL	$116,928	$96,011	$98,800	$105,733	$56,299	$144,000	$617,771

support for wastewater treatment projects (e.g., selecting engineering services, applying for federal grant/loan funding). Most ADDs also provide management assistance (e.g., budgeting, personnel policies) to wastewater utilities. Some ADDs provide wastewater facilities with assistance in day-to-day utility operation and maintenance.

The **Bluegrass Area Development District** (BGADD) in central Kentucky participated in the Section 205(j)/604(b) program from FFY 1990-92 and continues to support regionalization through its role in comprehensive planning assistance. With its pass-through funding, BGADD staff identified wastewater facilities in noncompliance or in or near bankruptcy and targeted them for technical assistance and regionalization efforts. The BGADD has further promoted regionalization language in comprehensive plans and subdivision regulations in several counties. In cooperation with the Rural Water Association, the DOW, and the Farmers Home Administration, the BGADD also prepared a Kentucky Rural Wastewater Assistance Manual for Policymakers. The document provides local officials with an understanding of the planning, design, funding, and operation of wastewater treatment facilities, and familiarizes these decision makers with the DOW's regionalization efforts. Through the Section 205(j)/604(b) program, the BGADD's efforts have eliminated nine package plants and extended first-time sewer service to 1400 (0.3%) of residents in the district.

The **Gateway District Health Department** (GDHD) has contracted with the DOW for wastewater regionalization activities in eastern Kentucky since 1990. The GDHD promotes public awareness of wastewater treatment issues, trains package plant operators, and publicizes the regionalization concept. Most notably, the GDHD completed an innovative and successful water/wastewater education project for students at Ezel Elementary School in the fall of 1992. The GDHD is now bringing the Ezel program to other schools in the Gateway Region. GDHD has also conducted rural wastewater disposal system surveys in the Gateway counties in an effort to identify areas where small-scale methods of sewage disposal are not working, assisted land owners in taking appropriate corrective action, and assessed people's knowledge of wastewater systems in order to develop effective educational programs. Gateway officials have been instrumental in securing public support in several unsewered communities for sewer line extension to regional facilities. Since entering the Section 205(j)/604(b) program, the GDHD's efforts have already eliminated three package plants, and another five will be eliminated upon completion of the current projects described above. Through the GDHD's work, first-time sewer service will have been extended to nearly 5% of the total households in the Gateway region by 1995.

The **Lake Cumberland Area Development District** (LCADD) in south-central Kentucky received Section 205(j)/604(b) funding in 1990-91 to oversee an environmental and economic feasibility analysis of wastewater treatment options to serve the city of Burnside. Following discussions with the DOW, the consulting firm retained by LCADD to conduct the value engineering study recommended a system to provide secondary treatment in a lagoon treatment facility and pipe effluent to irrigate the nearby General Burnside Golf Course. Accordingly, Burnside has prepared a Section 201 Facilities Plan to implement this

proposal. This plan has not yet received funding assistance, but the Section 205(j)/604(b)-funded study has laid most of the technical groundwork for the project. Burnside thus should be able to proceed quickly when it does receive funding for facility construction.

The **Purchase Area Development District** (PADD) in western Kentucky has participated in the Section 205(j)/604(b) program since FFY 1990. The PADD's not-for-profit Purchase Public Service Corporation (PPSC) provides technical assistance to several wastewater facilities in the ADD. The PPSC also contracts to provide routine operation and maintenance services and has even assumed ownership of plants. The PPSC performs necessary repairs or modifications to such forfeited systems and seeks to incorporate them into more comprehensive systems where possible. Since entering the Section 205(j)/604(b) program, the PADD has assumed direct ownership of six package plants, of which two have been eliminated. Staff provide routine operational assistance to at least six package plants and ad hoc consultant service to approximately 15 to 20 others.

The **Big Sandy Area Development District** (BSADD) in eastern Kentucky participated in the Section 205(j)/604(b) program from FFY 1990-1992 and will seek funding again in FFY 1994. The ADD offers technical and financial expertise to wastewater treatment plants that are having problems meeting permit requirements. The ADD also works to eliminate poorly operated package plants, find alternatives for inadequate systems, and raise public awareness of wastewater treatment problems in the region. With the aid of concerned citizens, the BSADD continues to discover unpermitted, previously unknown package plants and report them to the DOW. Since entering the Section 205(j)/604(b) program, the BSADD estimates that regionalization efforts have eliminated or identified as no longer in operation approximately 29 package plants, identified 15 unpermitted package plants for incorporation into the KPDES program, helped implement line extensions to more than 70 residences and businesses, and resolved problems involving more than 20 failing package plants.

The **Green River Area Development District** (GRADD) in western Kentucky entered the Section 205(j)/604(b) program in FFY 1993. The ADD is working to encourage several communities to plan and seek funding for new or expanded wastewater facilities. The GRADD is also working to establish a Small Wastewater Systems Technical Assistance Program (SWSTAP) to provide technical and financial planning assistance to the owners and operators of small systems on a regular basis.

The **Kentucky River Area Development District** (KRADD) in southeastern Kentucky entered the Section 205(j)/604(b) program in FFY 1993 to address sewage problems in the North Fork of the Kentucky River. The DOW has issued swimming advisories on the North Fork for the last three years, citing excessive levels of fecal coliform bacteria. DOW enforcement has brought almost all municipal and package treatment plants into compliance and improved water quality enough to justify lifting the swimming advisory on the lower 76 river miles in June 1993; however, high bacteria levels upriver still indicate a pervasive problem. DOW and KRADD staff have organized a multi-agency task force to deal with the issue. The core working group, composed of personnel in the KRADD, DOW, Cabinet for

issue. The core working group, composed of personnel in the KRADD, DOW, Cabinet for Human Resources, Kentucky River District Health Department, and Division of Plumbing, has solicited input from local citizens and elected officials. Much of the remaining problem is attributed to residential straight-pipe discharges of raw sewage and failing septic systems. Based on their findings, the task force anticipates promoting regionalization. The group has also developed a proposal for funding under the Section 319 nonpoint source pollution program to implement a watershed demonstration project to address straight-pipe discharge or septic system problems in the upper North Fork Kentucky River. The funds will be used for education, BMP implementation, monitoring, and project management.

Progress in the regionalization effort was evident in 1990 when more discharge permits were inactivated than new ones were issued (Figure 5-5). New permits included discharges that served previously unsewered areas in the state, making the trend even more positive. Progress continued to be made in 1992 and 1993.

A significant reduction in the number of package plants across the state will soon be realized because of projects now in the planning or construction stages in Bath, Boone, Boyd, Daviess, Franklin, Jefferson, McCreary, Oldham, Perry, and Rowan counties. These projects will eliminate some 170 facilities.

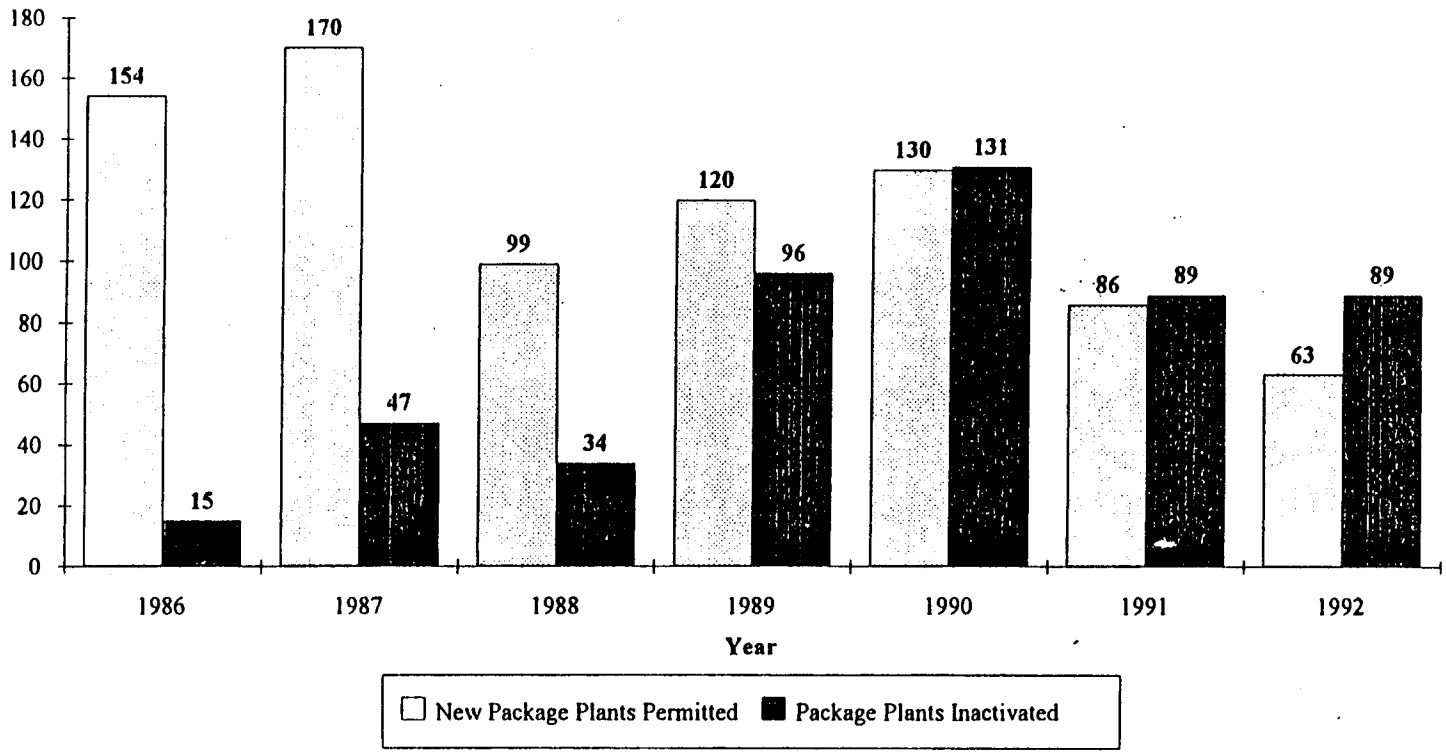
Boat Sewage Disposal

The divisions of Water and Water Patrol handle numerous complaints every year during the recreational season about sewage discharged from boats, especially houseboats. Citizens express concern about the aesthetic offenses and potential health problems associated with these discharges. On most water bodies in Kentucky, boats are not permitted to discharge any sewage, treated or untreated. However, state officials suspect that many of these boats either are not equipped with the required holding tank-type Marine Sanitation Device (a Type III MSD), or the owners simply empty the tank directly into the water. Even on water bodies where the state has no authority to prohibit treated discharges from approved "Type I" MSDs, boats equipped with the required MSD and moored in secluded coves or docked at marinas can cause localized water quality problems.

Early in 1993, staff from the DOW, Division of Water Patrol, and Department of Parks began developing a Memorandum of Understanding (MOU) to establish an arrangement for jointly addressing the problem. The MOU allocated responsibilities for education and construction activities as funds became available.

Even before the MOU was completed, staff discovered a guidance document on the recently announced Clean Vessel Act (CVA) grant program. Through the federal Clean Vessel Act of 1992 (Pub. L. 102-587), Congress has made funds available to both coastal and noncoastal states for the construction, renovation, operation, and maintenance of pumpout and waste reception facilities for sewage generated on boats and for public education efforts to encourage responsible boat sewage management. The grant program,

Figure 5-5
New Package Plant Permits v. Inactivations
1986-1992



administered through the U.S. Fish and Wildlife Service, will distribute $40 million in grant money over the next five years on a 75% match basis. Both public and private marinas are eligible to receive assistance, although the program must be administered through State agencies.

The Kentucky agencies participating in the MOU and the Department of Fish and Wildlife Resources (KDFWR) submitted an application for $212,000 in CVA funds in the fall of 1993. The KDFWR entered the grant proposal process when it was designated as Kentucky's Single Point of Contact to receive the federal CVA funds. Under the grant work plan, these agencies propose to construct boat sewage pumpout and waste reception facilities at four state-operated marinas in Kentucky and to conduct statewide educational efforts to encourage responsible boat sewage disposal and promote the use of pumpout facilities.

Education activities in the project would include brochures, public service announcements, and public meetings to educate boaters, marina operators, and boat manufacturers and retailers about proper boat sewage management. The DOW would obtain a database of boat owners in the state who are most likely to have onboard toilet facilities, in order to administer a questionnaire and provide the boat owners with information about the proper disposal of their boat sewage. Water Patrol officers would also visit marinas to provide education about proper boat sewage disposal and to assess sewage disposal needs. This proposed public education campaign is intended to raise awareness of the problems associated with boat sewage discharges, to encourage installation and proper use of Type III (holding tank) MSDs on all boats, (even those used on discharge water bodies), and to promote the use of existing and soon-to-be-constructed pumpout facilities.

Initial pumpout facility construction activities would take place at the state marinas in Jenny Wiley State Resort Park (Dewey Lake), Rough River State Resort Park, Dale Hollow State Park, and Buckhorn Lake State Park. These sites were proposed based on the availability of data to document the need for pumpout facilities and on the decision that state entities should take the lead in demonstrating responsible marina management. However, private marina owners have also begun to communicate interest in securing funding, and the agencies proposing to cooperate in the FFY 1994 project plan to include funding specifically for private-sector projects in their 1995 application .

The cooperating agencies plan to apply for more CVA funding in 1995 to expand their education efforts and to construct and upgrade more pumpout facilities around the state.

Section 401 Water Quality Certification

Statutory authority over water quality certification is contained in KRS 224.16-50. All existing uses of surface waters, including those of wetlands, are protected under Kentucky Water Quality Standards (401 KAR 5:026;029;031) even if the waters and their designated uses are not specifically listed in regulation. "Existing use" is defined as attainment of legitimate uses in or on a surface water of the Commonwealth on or after November 28,

1975 (401 KAR 5:029(1)(p)). The state may issue, waive, or deny water quality certification for any federally permitted or licensed activity that may result in a discharge into one acre or more of wetlands or 200 linear feet of blue-line stream as designated on a U.S.G.S. 7.5 minute (1:24,000) topographic map. The state is to certify that the materials to be discharged into surface waters of the Commonwealth will comply with the applicable effluent limitations, water quality standards, and any other applicable conditions of state law. Discharges may include, but are not limited to, dredged spoil, solid waste, garbage, rock, and soil. The DOW (1993) also has issued guidelines to mitigate unavoidable impacts to streams.

The state certification process is typically triggered through an individual Section 404 permit application and the associated COE Public Notice. Water quality certifications are also required for COE nationwide permits as listed in Table 5-9. Nationwide permits include discharge activities that are substantially similar in nature and have been determined by the COE to cause minimal adverse impacts to waters of the U.S. Water quality certifications of nationwide permits protect water quality and aquatic life from a wide array of discharge activities within waters of the Commonwealth.

Table 5-10 summarizes 401 certification activities for this 305(b) reporting period. While the program has become increasingly effective in protecting waters of the Commonwealth from activities not typically regulated by point source programs. There is a lack of sufficient resources for compliance assurance and enforcement programs. The COE and DOW need to significantly increase surveillance and enforcement activities in order to ensure permitted and unpermitted activities are not degrading or eliminating stream and wetland resources.

Nonpoint Source Pollution Control Program

The Kentucky Nonpoint Source Management Program provides a comprehensive description of Kentucky's strategy for controlling nonpoint source (NPS) pollution. The document was prepared by the DOW in accordance with the requirements of the Water Quality Act of 1987 and received full approval from the U.S. Environmental Protection Agency (EPA) in November 1989. The Management Program describes the control measures, including best management practices (BMPs), that Kentucky will use to control pollution resulting from each NPS pollution category (agriculture, construction, etc.) identified in the Kentucky Nonpoint Source Assessment Report, the programs to achieve implementation of those BMPs, and a schedule for implementing those programs.

The Kentucky Nonpoint Source Assessment Report is a detailed, comprehensive list of nonpoint impacts, including evaluated information obtained from a 1987 Nonpoint Source Pollution Survey. The water quality data in the report are used to identify NPS priority watersheds for pollution remediation activities. The Kentucky Nonpoint Source Assessment

TABLE 5-9: NATIONWIDE PERMITS (NWP)

NWP Number	WQC Status	Purpose
1	A	Aids to navigation
2	A	Structures in artificial canals
3	A	Maintenance
4	A	Fish & wildlife harvesting, enhancement and attraction devices and activities
5	A	Scientific measurement devices
6	A	Survey activities
7	A	Outfall structures
8	A	Oil and gas structures
9	A	Structures in fleeting and anchorage
10	A	Mooring buoys
11	A	Temporary recreational structures
12	B	Utility line backfill and bedding
13	B	Bank stabilization
14	B	Minor road crossing
15	B	U.S. Coast Guard approved bridges
16	C	Return water from upland contained disposal areas
17	B	Hydropower projects
18	C	Minor discharges
19	A	25 cubic yard dredging
20	A	Oil spill cleanup
21	B	Surface coal mining activities
22	A	Removal of vessels
23	B	Approved categorical exclusions
24	A	State administered Section 404 program
25	A	Structural discharge
26	B	Headwaters and isolated waters
27	B	Wetland and riparian restoration and creation activities
28	A	Modifications of existing marinas
32	A	Completed enforcement actions
33	B	Temporary construction, access and dewatering
34	A	Cranberry production activities
35	A	Maintenance dredging of existing basins
36	A	Boat ramps (no discharge in wetlands)
37	B	Emergency watershed protection and rehabilitation
38	B	Cleanup of hazardous and toxic waste
40	A	Farm buildings

(A) 401 water quality certification not required
(B) 401 general certification denied for activities disturbing >200 linear ft. of stream and/or >1 acre of wetland; individual certification required
(C) 401 general certification denied in total; individual certification required

Table 5-10: 401 Certification Activities		
	1992	1993
Section 404 activity	63	66
Nationwide activity	57	152
Certification issued	102	153
Certification waived	4	2
Certification denied	7	31
Certification exempt	4	32

Report and the NPS priority watershed information are available from the DOW's Nonpoint Source Pollution Control Program.

This Report to Congress on Water Quality contains an updated list of NPS impacted waterbodies (Appendix E). This list is a subset of the Kentucky Nonpoint Source Assessment Report and identifies only those waterbodies significantly degraded by NPS pollution and surface waters that do not fully support their designated uses.

Because nonpoint source pollution arises from a wide spectrum of diffuse sources throughout the Commonwealth, there are a variety of programs in a several agencies that address NPS pollution control. The DOW serves as the lead oversight agency for these programs. Agencies and institutions cooperating in the implementation of Kentucky's NPS Management Program include, but are not limited to, the Kentucky Division of Conservation (DOC), Division of Forestry, Division of Waste Management, Division of Pesticides, Department for Surface Mining Reclamation and Enforcement, Kentucky Conservation Districts, Kentucky Geological Survey, U.S. National Park Service, U.S. Soil Conservation Service (SCS), U.S. Agriculture Stabilization and Conservation Service (ASCS), U.S. Forest Service, U.S. Geological Survey, U.S. Army Corps of Engineers, Tennessee Valley Authority (TVA), University of Kentucky Water Resources Research Institute, University of Kentucky College of Agriculture, Western Kentucky University, The Nature Conservancy, and the American Cave and Conservation Association. The Kentucky nonpoint source program has received a total of $5,621,258 from EPA through Section 319 and Section 205(j)(5) grants for fiscal years 1990 through 1994 that provides funds for many of these programs. Matching non-federal funds have also been provided for the programs as required by Section 319.

Monitoring

Nonpoint source pollution problems in the waters of the Commonwealth originate from land-based activities. The direct interrelationship between land activities and water quality necessitates that both land and the aquatic environments be monitored and evaluated. To this end, the NPS Pollution Control Program has formed two on-site monitoring field teams. Each team consists of a DOW field team leader with an aquatic ecology background and a DOC or SCS field team member with an agronomy/agriculture background.

The actual collection, assessment, evaluation, and interpretation of both water quality and land-based data is the responsibility of the field teams. Physical characteristics, water chemistry, aquatic biological community structure, and land-based activities are different aspects of the waterbody's ecosystem that may be monitored. A multifaceted approach is necessary for NPS monitoring because of the mobility of NPS pollutants, the varying degrees of pollutant toxicity, the close interrelationship of land-based activities and NPS pollution, and the spatial and temporal variabilities that exist in natural, dynamic ecosystems. Nonpoint source standard operating procedures provide instruction and guidance in, and ensure standardization of, study plan development, station location selection, and monitoring of water quality, land use, land treatment, and weather. The Standard Operating Procedures for Nonpoint Source Water Quality Monitoring Projects (DOW, 1994) is available from the NPS Pollution Control Program.

Water quality monitoring is an important aspect of the NPS program, especially if monitored water quality data are lacking, existing NPS pollution problems need to be quantified, or documentation is needed to show changes in water quality where alterations in land use practices have occurred. Monitoring is an important component of NPS watershed pollution remediation demonstration projects.

Demonstration Projects

Mammoth Cave. Public awareness and concern over water quality problems affecting Mammoth Cave National Park resulted in the development of the Mammoth Cave Karst Area Water Quality Oversight Committee. Its purpose is to achieve coordination among citizens, land users, and government agencies in monitoring and improving water quality in this karst drainage area.

A multi-agency technical committee consisting of representatives from local and state SCS offices, ASCS, U.S. National Park Service, DOC, DOW, Kentucky Geological Survey, U.S. Geological Survey, TVA, University of Kentucky College of Agriculture, Western Kentucky University Department of Agriculture, and Western Kentucky University Center for Cave and Karst Studies was established to work with the Mammoth Cave Karst Area Water Quality Oversight Committee to develop a nonpoint source watershed pollution remediation project for the Mammoth Cave area. The DOW's role in the watershed project is focused on evaluating BMP effectiveness on select demonstration farms.

Local SCS and ASCS representatives prioritized farms in the Mammoth Cave project area as potential agricultural demonstration sites. Based on land resource needs, accessible water monitoring areas, and farmer cooperation, five farms were chosen as demonstration sites. The farms are being used to educate farmers in the project area about the use of best management practices (BMPs) for controlling nonpoint source pollution. BMPs have been implemented in a holistic, systems approach at two farms, and animal waste treatment facilities are planned for or have been installed at three other farms.

Multi-agency monitoring efforts are being used to document agricultural impacts on the quality of surface water, groundwater, and wetlands, and to address cross-media interactions. The DOW has developed monitoring study plans for each of the demonstration farms, has coordinated monitoring activities with other involved agencies, is monitoring water quality, and will interpret and document changes in water quality that relate to BMP implementation.

The DOW is employing different sampling techniques at the various demonstration farms. For the most part, monitoring focuses on stormwater runoff. Automatic samplers were installed at two farms to collect rain-event water samples for agronomic BMP evaluation. Animal waste management BMPs are also being evaluated at these two farms. Based upon a comparison of pre-BMP and post-BMP data at the animal waste management station, nutrients at the first farm are a fraction of what they previously were. Since the initiation of sampling at the agronomic monitoring station, various conservation practices have been employed to the cropfields being evaluated. Throughout the course of the sampling at this station, no significantly high levels of nutrients have been evident, and pesticides have been detected from only one sampling event. Pre-BMP data have been gathered at the second farm effort to monitor agronomic practices. Nutrient samples frequently yield total kjeldahl nitrogen (TKN) and nitrate-nitrate (NO_2+NO_3) nitrogen levels in the 1 to 6 mg/l range. Both TKN-N and NO_2 - NO_3 have been detected in excess of 10 mg/l at this farm. In addition, several pesticides have been detected.

Water quality monitoring efforts on the remaining three demonstration farms are designed to focus on animal waste management BMPs only. One of these farms has a feedlot operation that drains into a second-order stream. An upstream - downstream approach to biological, bacteriological, and physicochemical monitoring is being employed. Two automatic water samplers have been installed at this site, and several sets of pre-BMP data have been collected. The animal waste lagoon has not yet been installed at this site. A relatively large volume of pre-BMP data has been collected at this site. Based upon water chemistry data, bacteriological data, and evaluation of biological communities, both the downstream station, and to a lesser degree, the upstream station are impacted by animal waste. Because of animal access, which is influencing the upstream station, animal fencing and an animal waste lagoon will be installed at this site.

Another animal waste management demonstration farm has had an animal waste lagoon installed. Two sets of pre-BMP data were collected at this farm. Nutrient and fecal coliform levels were extremely high. Because the animal waste lagooon installed is a no-

discharge system, it is probable that water quality has improved significantly at this location. Because the animal waste system is designed as a no-discharge system, post-BMP samples have not yet been collected.

The third animal waste management demonstration farm has also had an animal waste lagoon installed. Both pre-BMP and post-BMP water chemistry and bacteriological data have been collected at this farm. However, prior to the installation of the animal waste lagoon, some efforts were taken to control the animal waste. As a result, there does not appear to be a significant difference between pre-BMP and post-BMP or upstream vs. downstream data.

Upper Salt River/Taylorsville Reservoir Watershed. Fishery problems in Taylorsville Reservoir, including fish kills and suppressed fish production, have prompted multi-agency concern over the water quality in the Upper Salt River watershed, which is being degraded by excessive pollutant loadings of bacteria, nutrients, and sediment. Land use in the watershed is predominately agriculture. The U.S. Army Corps of Engineers (COE), Kentucky Department of Fish and Wildlife Resources, and DOW are further investigating the water quality and fishery problems in the watershed. A comprehensive water quality monitoring study plan, developed by nonpoint source field biologists, describes the specific objectives and activities of agencies involved in water quality monitoring in the Upper Salt River/Taylorsville Reservoir (USR/TR) watershed.

Agricultural best management practice (BMP) cost-share funds have been made available to remediate nonpoint source pollution in the watershed as part of a U.S. Department of Agriculture (USDA) five year Hydrologic Unit Area Water Quality (HUAWQ) project. The goal of the HUAWQ project is to abate or prevent water quality degradation in both surface and groundwater in the watershed. To achieve this goal, the identified sources of contamination are being addressed by the use of best management practices. For FFY91 through FFY93, the HUAWQ project received a total of approximately $850,000. In addition, $55,000 cost-share funds were awarded in FFY92 as part of a Water Quality Incentive Program for implementing non-construction, management-type BMPs.

One of the first nonpoint source monitoring initiatives in the watershed was an intensive bacteriological investigation. The bacteriological data were used to: (1) assess point source compliance; (2) determine support or nonsupport of primary contact recreation; and (3) target animal waste BMPs in the watershed. Another bacteriological investigation is scheduled for 1994 to determine if the animal waste management practices have reduced bacterial contamination in the watershed.

Taylorsville Reservoir is highly eutrophic and has experienced problems with low dissolved oxygen concentrations, algal blooms, suppressed fish production, and occasional fish kills. The reason for these problems is the elevated nutrient levels in the streams feeding the reservoir (U.S. Army Corps of Engineers, 1992). In an effort to alleviate these

problems, the U.S. Soil Conservation Service, Kentucky Division of Conservation, COE, and the DOW have undertaken studies and projects to determine the nutrient concentrations in the reservoir and streams feeding the reservoir, specific sources of these nutrients, the amount of nutrient reduction needed to improve reservoir water quality, and methods to achieve the needed reductions. The U.S. Geological Survey is also assisting with high-flow water sample collection through a cooperative agreement with DOW.

The water quality data was analyzed, and a report titled Sources and Loadings of Total Phosphorous into Taylorsville Lake (Kentucky Division of Water, 1993) was produced. Data from 13 stations throughout the basin were used in this report. Samples were collected during low, median, and high flow events. Sampling continues at certain locations to provide a more extensive data base.

Information from this report will be used to calculate a TMDL to provide resource agencies with estimates for the reductions necessary to improve lake water quality. The agencies will then be able to determine the specific actions that can be taken to bring about these reductions. The report recommends that implementation of land management practices to reduce erosion and the creation of riparian zones along stream channels would have the greatest impact in reducing phosphorus concentrations in the streams draining to Taylorsville Reservoir. Point source discharges contribute a very small percentage of the total nutrient load to the lake.

Big South Fork/Bear Creek Interstate Watershed. The Big South Fork/Bear Creek demonstration project is located in an interstate watershed that lies in both Tennessee and Kentucky. Bear Creek flows north from Tennessee into Kentucky, where it joins with the Big South Fork of the Cumberland River. A large portion of the Big South Fork watershed is classified and operated as a National River and Recreation Area by the National Park Service. Nonpoint source pollution impacts to Bear Creek begin outside the Big South Fork National River and Recreation Area (BSFNRRA) in Tennessee. The lower portion of Bear Creek lies in Kentucky, mostly within the BSFNRRA.

The Bear Creek drainage is primarily affected by unreclaimed strip mines. The abandoned coal mine sites are characterized by heavily eroding spoil banks and acid mine drainage. Minimal reclamation efforts were implemented after mining, and consequently, severe water quality problems exist because of abandoned mine land runoff. The biological communities within Bear Creek are severely impacted by acid mine drainage, and the creek does not support the aquatic life use. Values for pH ranged from 4.3 to 8.2 SU, with an average value near 5.6 SU. These low pH values also affect contact recreational uses.

The goal of this project is to improve water quality by reducing acid mine runoff, improving stream and bank habitat, and improving citizen understanding of the project. To meet this goal, the Tennessee Nonpoint Source Program, in cooperation with the Tennessee Land Reclamation Program, developed a rehabilitation plan for the Bear Creek watershed that calls for the implementation of BMPs and water quality monitoring. The BMPs include

drainage control structures, subsurface limestone drains (anoxic alkaline trenches), aeration, and artificial wetlands.

To document changes in water quality associated with BMP implementation, The Tennessee Nonpoint Source Monitoring Team is monitoring water quality in the Tennessee portion of Bear Creek before and after BMP implementation. The Kentucky Nonpoint Source Monitoring Team is supplementing Tennessee's activities by monitoring water quality at a station at the mouth of Bear Creek in Kentucky. To address possible temporal variability in water quality of Bear Creek, Rock Creek, a Kentucky Outstanding Resource Water, has been selected as an appropriate reference stream. An automatic water sampler was installed at the Bear Creek station to collect rain-event water samples for analysis. Quarterly biological monitoring is being conducted at both the impacted and reference stations in order to document recovery of the stream biota. To ensure that biological data from Tennessee and Kentucky are comparable, Tennessee Standard Operating Procedures are being used by Kentucky for this project.

Fleming Creek. Fleming Creek, a tributary of the Licking River, is 39 miles long and drains an area of 61,670 acres. The mainstem and tributaries are contained almost entirely within Fleming County in northeastern Kentucky. Fleming County ranks third statewide in number of dairy cattle. Eighty-five feedlot operations occur in this watershed. Moreover, an estimated 1.7 million cubic feet of animal waste is washed into local streams annually, resulting in water quality degradation.

A U.S. Department of Agriculture project proposal seeking BMP cost-share funds for the Fleming Creek watershed was approved for funding in 1992. The DOW and U.S. Department of Agriculture are cooperating agencies in this project area. DOW has the responsibility of monitoring the effectiveness of the pollution remediation activities in the watershed.

The water quality monitoring study plan developed for this project calls for monitoring activities in three distinct phases. The first phase consisted of a bacteria and nutrient survey throughout the watershed during both high and low flow conditions in the spring and summer of 1992. The main purpose of this phase was to examine the entire watershed with respect to point and nonpoint pollution sources to target those areas most affected by animal wastes. It is envisioned that this survey will be repeated once all BMPs are installed to determine if water quality improvements occurred as a result of BMP implementation.

The second phase consists of long-term monitoring at select stations to measure water quality changes in the watershed over time resulting from BMP installation. Nutrient water quality data is the focus of this monitoring phase.

The third phase consists of biological and physicochemical data collection at two of the more impacted tributaries within the watershed as well as a station located on Fleming Creek downstream of all proposed BMPs. This phase will supplement phase two physicochemical

data collection. Biological communities will be biometrically compared over time to evaluate and document changes in community structure that reflect improvements in water quality.

To date, only pre-BMP water quality data have been collected. These data indicate that Fleming Creek has been impacted from animal waste. The bacteriological survey indicated that the entire watershed is affected. Stations were established on Fleming Creek and at the mouth of every major tributary within the watershed. Fecal coliform levels ranged from 500 colonies per 100 ML to over 15,000 colonies per 100 ML at the tributary stations for the high-flow event. Total phosphorus and nitrogen levels (TKN and NO_2 - NO_3) have been detected at elevated levels (1-3 mg/l), particularly at the tributary stations. Based upon algal data, eutrophic to hypereutrophic conditions occur at certain locations within the watershed. In addition, there is an unusually high number of tolerant macroinvertebrate species at Allison Creek station. However, a preliminary evaluation of biological communities in Fleming Creek does not indicate impairment. A more conclusive characterization of pre-BMP conditions will be provided to EPA in a report later this summer.

Data Collection/Data Management

A necessary and important function of the nonpoint source program is the collection and management of NPS-related information. The cooperative, multi-agency nature of the program prescribes the reliance upon, and utilization of, existing data such as land use classification statistics, baseline water quality values, and best management practice evaluations. To this end, an NPS document library has been developed. All NPS-related documents are cataloged, and pertinent data are entered on computer for future retrieval. In addition, a computer literature search service has been identified and utilized for accessing other scientific and technical information pertinent to the program. Several statewide databases have been identified and utilized, including county-specific fertilizer and pesticide databases.

Education

To a large extent, the implementation of BMPs to control NPS pollution relies upon voluntary adoption of BMPs by those who manage the use of Kentucky's land resources. Therefore, education plays a vital role in Kentucky's NPS Management Program. NPS education programs inform land users and other Kentucky citizens about the causes, consequences, and solutions (BMPs) for the various types and sources of NPS pollution.

The DOW nonpoint source program supports and coordinates with a wide spectrum of NPS education activities and programs conducted by a number of agencies and institutions. The DOW has provided program speakers for school classrooms, field days, environmental fairs, civic groups, trade organizations, and professional meetings. Additionally, exhibits and other educational materials have been provided for use in conferences, fairs, field days, and clean-up days.

Several NPS education projects supported by 319 funds have been or are currently being conducted under the oversight of the DOW NPS program:

- The slide/video program and accompanying brochure, "Every Time It Rains," a general introduction to NPS pollution problems in Kentucky targeted to the general public, was produced by the Center for Math, Science, and Environmental Education at Western Kentucky University (WKU).

- WKU is also producing a video program on abandoned minelands and water quality, targeted to general audiences in Kentucky and Tennessee. It centers on the Bear Creek/Big South Fork demonstration project as an example of how these problems can be solved.

- The Kentucky Division of Forestry developed a forestry NPS video, slide/tape show, brochure, and best management practices manual to promote the use of forestry best management practices.

- The Gateway Region Environment-Education Network (GRE-EN), based in the Gateway District Health Department, conducted a multi-faceted education program in the five-county Gateway region that targeted agriculture, septic systems, and illegal dumps.

- The Warren County Conservation District has been conducting a number of educational activities that present NPS pollution problems and solutions arising from construction and urban runoff in karst regions, including contractor field days and the construction of a high-quality portable exhibit.

- The American Cave Conservation Association (ACCA) built an exhibit in its American Museum of Caves and Karstlands, located in Horse Cave, which illustrates the many types of human activity that can pollute groundwater. ACCA is currently developing and implementing a statewide karst education program that includes a school curriculum, a series of newspapers for classrooms, and teacher training workshops.

- The Groundwater Education and Rural Well Water Testing Program conducted public educational meetings in most of Kentucky's 120 counties concerning groundwater quality. Private well water analysis and technical assistance to remedy problems revealed by the testing were made available to program participants.

- The Floyds Fork Community Education Project in Jefferson County is developing three video tape presentations for developers, residents of the Floyd's Fork watershed, and high school students. These programs present urban runoff water quality problems and solutions.

- The University of Kentucky Cooperative Extension Service is adapting the national Farmstead Assessment System (Farm*A*Syst) program for use in Kentucky and will produce sets of informational flyers and assessment worksheets and conduct a pilot program in at least two Kentucky counties. Farm*A*Syst is a comprehensive farm site assessment that helps rural residents and farmers assess the impact of their farmstead structures, soil geology, and management practices on groundwater quality.

The Water Watch program (described in other sections of this report) has proven to be a particularly valuable channel for educating citizens about NPS water quality problems and solutions. The Water Watch and NPS program staff are working to further expand Water Watch educational materials and programs to include more information on BMPs and NPS pollution control, train participants to identify land use activities that are contributing to NPS pollution of their adopted waterbody, and collect data about water quality, aquatic life, and aquatic habitat conditions, including supplemental monitoring for NPS demonstration projects. Specifically, the Water Watch Nonpoint Source Local Education Initiative, funded under Section 319, is conducting training workshops for selected Water Watch groups and is producing accompanying sets of specific localized publications and localized slide/video programs. It is also conducting a program for high school students to study the impact of spring rainstorms on stream water quality that utilizes immunoassay screening for pesticides.

Nonpoint Source Impacted Waterbodies

Appendix E of this report contains a series of tables that identify Kentucky waterbodies significantly impacted by nonpoint source pollution. The format used in these tables is illustrated in Figure 5-6. Information contained in the tables includes the waterbody code, waterbody (stream, lake, wetland, groundwater) name, NPS categories, parameters of concern, data sources, method of assessment, and designated uses not fully supported (for surface waters only).

Figure 5-6. Data Table Organization for Nonpoint Source Impacted Waters

WATERBODY CODE	STREAM NAME	NPS CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
KY050000101-018	FLEMING CREEK	14 10 16 80	BACT,NUTR, SED,MET	KNPS, 1987; KDOW-NPS, 1992	MONITORED	PCR

Waterbody Name and Code

The identification of waters impacted by NPS pollution consists of the name of the principal stream, lake, wetland, or groundwater site. The code (for streams and lakes) further delineates the waterbody being assessed and has been indexed in a computer storage and retrieval system for easy access to information compiled for the waterbody.

NPS Category

The categories and subcategories of NPS pollution sources for each of the listed waters and their codes were established in accordance with EPA's Nonpoint Source guidance. Refer to Appendix E for a listing of the codes and sources.

Additionally, the NPS categories were prioritized based on the severity of the NPS impact to a specific waterbody. Prioritized categories appear in numbered columns, indicating the relative severity of NPS impacts. Column one (1) identifies the NPS impact of greatest concern.

Parameters of Concern

This information indicates the parameters that significantly contribute to the NPS impacts. These parameters include sediment, nutrients, bacteria, chemicals, pesticides, and metals. See Appendix E for a list of the parameters and their abbreviations.

Data Sources; Monitored/Evaluated

The information identifying NPS impacts was gathered from many different sources. Both evaluated and monitored data were obtained and used to assess the NPS impacts to streams and lakes, wetlands, and groundwaters. Two levels of assessment were used to determine the impact of NPS pollution: monitored and evaluated. "Monitored" waters are those that have been assessed based on current site-specific water quality data. Waters were labeled as being "evaluated" if they were judged to be impacted by NPS pollution based on field observations, citizen complaints, fish kill reports, etc. Additionally, specific monitored, water quality data more than five years old were labeled as evaluated. A bibliography listing data sources used for assessing nonpoint source impacts is provided in Appendix E.

Uses Not Fully Supported

Kentucky water quality regulations classify streams based on identifiable uses. The stream use classifications are: Warmwater Aquatic Habitat (WAH), Coldwater Aquatic Habitat (CAH), Domestic Water Supply (DWS), Primary Contact Recreation (PCR), Secondary Contact Recreation (SCR), and Outstanding Resource Waters (ORW). The use classifications help protect public health and welfare and protect and enhance the quality of water for aquatic life. Partially supported designated uses are identified with a "P," and threatened designated uses are identified with a "T." Threatened use means that while a use or uses are fully supported in these waterbodies, NPS pollution arising from current land use activities in those watersheds could potentially make these waterbodies not support a use.

Surface and Groundwater Impacted by Nonpoint Source Pollution

Rivers, Streams, and Lakes. Nonpoint source pollution of Kentucky's rivers, streams, and lakes is widespread, occurring in virtually every county of the state. Agricultural activities are the major sources of NPS pollution in Kentucky, both in terms of statewide distribution and the severity of pollution within a given area or watershed.

Bacteria from uncontrolled feedlots, animal holding areas, unmaintained manure lagoons, pasture land, and cattle access to streams is the primary agricultural pollutant impacting the waters of the Commonwealth. Bacterial contamination prevents numerous stream and river miles from supporting swimming and other human contact recreational activities. High bacteria loads are indicative of water-borne pathogens that can cause human health problems.

Siltation from disturbed land is another common agricultural nonpoint source pollutant in Kentucky. It can cause navigational and flooding problems, threaten aquatic life, and transport large amounts of other pollutant materials. For example, nutrients and pesticides, two additional agricultural NPS pollutants, bind to and are transported along with sediment particles to streams and lakes. Other sources of agricultural NPS pollution include streambank erosion from unrestrained livestock, irrigated crop production, and specialty crop production (truck farming).

Surface coal mining activities are the most extensive and critical sources of NPS pollution that impact the streams and lakes of the Eastern and Western Kentucky Coalfields. Underground coal mine activities are a common secondary source of NPS pollution in these regions. Other mining-related nonpoint pollution sources in the state include runoff from limestone quarries and abandoned fluorspar mines.

Sediment, acid mine drainage, and elevated iron and sulfate concentrations are the principal pollutants associated with abandoned surface and underground coal mining activities. Sedimentation arises from stripping operations, haul roads, spoil banks on unreclaimed abandoned mine areas, deforested areas, sediment retention structures that have

failed or do not operate properly, and sometimes surface disturbances associated with areas permitted for deep mining. Abandoned mines, which include underground mines and surface mines abandoned illegally or before mining regulations took effect, generally contribute the most severe acid water problems. Impacts from limestone quarries generally involve slight downstream increases in siltation and alkalinity.

Petroleum extraction activities occur in several regions of the Commonwealth. Improper brine discharges from oil and gas drilling operations result in high chloride levels, which in some areas are severe enough to eliminate aquatic fauna and adversely affect downstream public water supplies. Sedimentation from improperly constructed and maintained oil and gas facility service roads is also of concern.

Siltation of streams and lakes frequently results from silvicultural activities, or activities related to use of forest lands. Erosion can result from logging operations, saw mill runoff, reforestation, residue management, forest fires, haul road construction and maintenance, and woodland grazing of livestock. NPS pollution from silvicultural operations is widespread in Kentucky and is of special concern in steeply sloping areas.

Sediment is the major pollutant arising from several other source categories of NPS pollution. Construction activities (residential, commercial, or highway) can expose bare soil, resulting in severe erosion and sedimentation. Hydrologic habitat modification activities such as dredging, channelization, and flow regulation/modification, can alter the stream flow, disturb adjacent land area, and cause streambank erosion. Streambank erosion can also be caused by unrestrained access for livestock and increased runoff from impervious surfaces in urban areas.

Nonpoint source pollutants other than sediment are carried by runoff from several different categories of sources into Kentucky's streams and lakes. Stormwater runoff from urban areas washes nutrients, pesticides, bacteria, petroleum products, and a broad spectrum of other toxic substances into streams and lakes. On-site wastewater system runoff, especially from malfunctioning septic tanks and straight pipes, carries bacteria and nutrients to waterbodies. Solid waste and sewage is another frequently cited NPS pollution category. While garbage, refuse, and debris primarily clog watercourses and create aesthetic eyesores, they can also be a water quality problem because of pollutant residues remaining in the discarded containers and packaging. Finally, herbicides and other toxic substances that are used in highway and railroad right-of-way maintenance, discarded in landfills, or used in industrial land treatment have been reported to pollute Kentucky's streams and lakes.

Wetlands. Kentucky possesses a diversity and abundance of wetland resources. The major wetlands are identified as riverine, palustrine, and lacustrine. Human activities which adversely impact wetlands include resource exploration and extraction, agriculture, hydrologic/habitat modification, silviculture, and construction. Resource extraction activities of some type probably affect more acres of wetlands in Kentucky than any other category. Nonpoint source pollutants such as acid mine drainage and sedimentation have adversely

impacted the water quality, soil saturation time, and vegetation of these wetlands. Another resource extraction activity, petroleum exploration and extraction, also has a detrimental effect on wetlands. Oil well drilling often results in modifications to the existing drainage patterns, with subsequent changes in adjacent wetland ecosystems. Additionally, oil spillage and brine discharges from active oil wells adversely impact wetlands.

Historically, the conversion of wetlands for agriculture has resulted in substantial losses of wetland resources in the Commonwealth. In addition to direct wetland loss through conversion, agricultural nonpoint source runoff containing high concentrations of sediments, nutrients, and pesticides can potentially degrade wetland areas.

Riparian wetlands are impacted by hydrologic/habitat modifications such as channelization and flood control activities. Straightening channels for flood control can prevent the natural flooding of wetlands and subsequently reduce their mineral and organic nourishment. Constructed levees can cut off wetlands from floodplains or increase water levels, both of which alter the natural soil saturation period and can cause an adverse change in wetland functions.

Another threat to wetland resources is silvicultural activities. Timber harvesting is periodically desired on wetland areas with large stands of timber. However, logging operations typically result in soil compaction and sedimentation, resulting in wetland alteration and degradation.

Wetlands in Kentucky are also affected by construction activities. Land development, highway construction, and other construction related activities can result in both wetland conversion and nonpoint source pollutant loading to adjacent wetlands.

Groundwater. One of the most valuable resources in Kentucky is the state's extensive groundwater system. Groundwater is susceptible to nonpoint source contamination. Karst regions, which comprise about 50 percent of the Commonwealth, are especially vulnerable. Approximately 48 of Kentucky's 120 counties are considered at high to moderate risk for groundwater contamination. The variety of geologic settings within Kentucky provide for significant local differences in the transport, accumulation, and breakdown of pollutants in the subsurface environment. The spatial variability of land uses also affects the distribution of pollutants in groundwater. Activities that can lead to groundwater contamination include agriculture, on-site sewage systems, waste disposal, resource exploration, development and/or extraction, improper well construction and operation, urban development, construction, underground injection of liquids, underground storage tank leakage, and spills.

Agricultural activities have a major impact on Kentucky's groundwater resources. Sedimentation is a common contaminant resulting from agricultural activities, especially in karst areas where sediment-laden streams sink into subterranean caverns. Other identified contaminants from agricultural activities are pesticides, nutrients, and bacteria. Some types of pesticides are soluble in water and are transported to aquifers by percolation of

precipitation or by runoff from cropland. Excessive amounts of nitrates, nitrites, and bacteria can potentially render an aquifer useless. These contaminants may reach groundwater sources via percolation of precipitation through contaminated soil or runoff from animal feedlots, animal waste storage facilities, animal waste spreading operations, and sewage disposal systems.

Another major nonpoint source impact to Kentucky's groundwater is improperly constructed or maintained on-site sewage disposal systems. Bacteria, nutrients, and potentially hazardous chemicals are the major parameters of concern. Leakage from these systems percolates through the soil into groundwater sources. Contamination of well water by on-site sewage systems can pose serious health problems to well users.

Contaminants such as PCBs, metals, bacteria, and hazardous chemicals are major parameters of concern in leachate and runoff from inadequately constructed or maintained solid or hazardous waste disposal facilities. In karst areas, the relatively rapid rate of contaminant transport through the soil into the aquifer results in the decreased ability of the soil to filter contaminants from the water. Where a leak occurs in a facility's liner, contamination could be swift and extensive. Runoff from such areas can potentially cause serious degradation problems in groundwater systems. Illegal dumping of wastes into sinkholes, along roadsides, or in secluded areas may also impact groundwater resources.

Resource exploration, development, and extraction activities can cause regional nonpoint source groundwater contamination problems. Petroleum extraction activities, such as the construction and operation of oil and gas wells, can cause groundwater contamination. Elevated concentrations of chlorides and total dissolved solids in groundwater are associated with brine contamination from oil and gas well drilling activities. Brine can enter the groundwater system directly during the well drilling process via improper underground reinjection or as a result of water-flooding techniques commonly used for secondary petroleum recovery. Other parameters of concern from petroleum activities include metals and sulfates. Groundwater systems in Kentucky's coal regions are particularly vulnerable to NPS pollution impacts as well. The major parameters of concern regarding coal mining activities are elevated concentrations of metals and acid mine drainage. To a varying degree, groundwater quality near abandoned mines can be impacted by nonpoint source contaminants. The Division of Abandoned Lands has had a significant number of requests from local governments for assistance in developing public water supplies where existing groundwater sources have been adversely impacted.

Urban areas and construction activities have been identified as sources of nonpoint source contaminants of groundwater. In urban karst areas, groundwater is vulnerable to contamination by metals, bacteria, pesticides, and oil and grease from street runoff. Highly contaminated stormwater runoff can directly recharge groundwater through sinkholes used as auxiliary stormwater disposal facilities and sinking streams. Sediment is usually the major contaminant from construction activities.

Underground injection of liquid wastes, underground storage tanks, and spills are other NPS polluters of groundwater. Underground injection of liquid wastes will severely impact an aquifer if the substance is injected directly into the aquifer. The parameters of concern are dependent upon the identity of the injected liquid. Leaking underground storage tanks can also cause localized groundwater damage. Petroleum products can readily percolate into underlying aquifers. Spills of toxic materials can reach groundwater systems by percolation or surface water recharge. Contamination from a spill can cause major degradation of a groundwater source.

Not only does nonpoint source pollution affect the quality of groundwater used for drinking, it also threatens aquatic organisms. Subterranean river basins and aquifers provide a unique habitat for certain endangered and rare species. Three rare animal species, Amblyopsis spelaea (Northern cavefish), Typhlichthys subterraneus (Southern cavefish), and Palaemonias ganteri (Kentucky cave shrimp) are known to inhabit subterranean waters in Kentucky. Survival of these species is directly related to suitable groundwater quality in the Mammoth Cave region. The only known population of P. ganteri is found in the Mammoth Cave region. It is listed as a federally endangered species by the U.S. Fish and Wildlife Service because it "is in danger of extinction throughout all or a significant portion of its range." Both A. spelaea and T. subterraneus are candidates for federal listing.

Oil and gas drilling presently occurs in several groundwater basins that supply Mammoth Cave. Brine from such activities commonly reaches aquifers potentially creating physicochemical changes in groundwater quality. Finally, agricultural activities resulting in sedimentation, excessive nutrients, and the introduction of pesticides into the groundwater can potentially impact rare cave species.

Appendix E identifies groundwater basins that are known to be impacted by nonpoint source pollution. They were assessed using both evaluated and monitored data. Evaluated data were based on non-monitored water quality information provided by DOW groundwater staff and the U.S. Geological Survey. More baseline data are needed to effectively evaluate the extent of contamination present in Kentucky's groundwater.

CHAPTER 6

RECOMMENDATIONS

LIST OF RECOMMENDATIONS

The actions listed below are recommended to achieve further progress in meeting the goals and objectives of the Clean Water Act.

- The EPA should take the lead in developing a comprehensive framework for coordinating federal programs that have a groundwater element. To foster this, EPA should include appropriate portions of state-specific Comprehensive State Groundwater Protection Programs as conditions in grants awarded to agencies in the state that have groundwater protection responsibilities. Without additional funding, it will not be possible to direct resources to new initiatives and maintain current efforts.

- Guidance on stormwater and combined sewer overflow permitting is needed in regard to: development of wet weather criteria, appropriate governing stream flows for water quality-based permits, the need to apply human health-based criteria for carcinogens, appropriate sampling techniques, and available and appropriate treatment procedures.

- Kentucky has benefitted from Clean Lakes Program funding, yet EPA removes the funding from its budget, relying on Congress to appropriate money through lobbying efforts of states and concerned citizens and lake supporters. EPA should retain funding for this porgram in its budget.

- A national framework for antidegradation implementation should be developed on the federal level.

- State nonpoint source and groundwater programs need to be funded at least at current levels. Reductions in 1995 funding would be a significant set-back to the progress being made.

- Dissolved metal criteria should be established by means of appropriate research and use of clean laboratory techniques.

- The federal consistency provision of Section 319 needs to be enforced so that federal agencies in the state are aware that their programs are to be consistent with the Nonpoint Source Management Program. Kentucky's NPS program has been hampered because it is unable to require best management practices on federally funded projects.

- Research at the federal level is needed to develop a logical progression of steps to identify and determine ways to eliminate chronically toxic components of effluents. National guidelines are needed to develop consistency in the implementation of whole effluent toxicity limits with the NPDES program.

- EPA should increase technical and financial support for state efforts on Section 401 activities, particularly in the areas of enforcement and compliance. National guidance is needed on wetlands program applications regarding antidegradation and chemical, physical, and biological criteria development for use classifications.

- Amendments to the Clean Water Act that address watershed planning should be flexible and allow states to develop programs with a high potential to improve water quality. It may be inappropriate to tie all monitoring and permitting efforts to sequential watershed cycles when problems are not related to point sources.

- Section 404 permit conditions need to be actively enforced through a joint Corps of Engineers and EPA compliance assurance program.

- Kentucky recommends that the State Revolving Loan allotment formula be modified to reflect current wastewater treatment facility needs.

- EPA should actively assist states in promoting wastewater regionalization.

- Greater financial support and simplified administration requirements should be provided to small communities (< 3500 population).